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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/917,796	07/31/2001	Jon C. Schaeffer	839-856	9520

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Arlington, VA 22201

EXAMINER

MCNEIL, JENNIFER C

ART UNIT	PAPER NUMBER
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1775

8

DATE MAILED: 11/29/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/917,796

Applicant(s)

SCHAEFFER ET AL.

Examiner

Jennifer McNeil

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 21 October 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 9-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 9-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruce et al (US 5,981,088) in view of Farmer (US 6,047,539) and further in view of Burns et al (US 6,042,898). Bruce et al teach a thermal barrier coating including a superalloy substrate, a MCrAlY bond coat and a ceramic layer deposited by EBPVD as discussed above. The ceramic layer is formed of zirconia stabilized with about 2-5 wt % of yttria. Bruce et al also disclose that the thermal barrier coating may be used on components used in hostile thermal environments such as turbine, combustor, and augmentor sections of a gas turbine engine (col. 2, lines 13-19). Bruce et al do not specifically teach a dense vertically cracked deposition of the ceramic layer. Farmer et al teach a method of preventing hot corrosion in a combustor of a gas turbine engine by deposition of a dense vertically cracked thermal barrier coating. The coating is applied so as to produce a segmented yttria-stabilized-zirconia ceramic structure having macrocracks formed therein which are oriented substantially perpendicular to an interface of the combustor component and the segmented ceramic structure. Farmer teaches that this particular type of thermal barrier coating has a greater resistance to particle erosion and thermal strain than those previously employed in gas turbine engine combustors. As it is taught by Farmer that depositing a YSZ coating by DVC deposition increases the resistance to thermal strain, and it is recognized by Bruce et al that the YSZ coating is used in multiple areas of turbine engines (i.e. combustors), it would have been obvious to

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one of ordinary skill in the art at the time of the invention to apply the coating of Bruce et al by this method to obtain a coating having increased thermal strain resistance.

Bruce and Farmer both teach metal bond coatings between the substrate and the zirconia layer, but do not mention the thickness thereof. Burns et al teach a thermal barrier coating system for a turbine engine component including a superalloy substrate, a bond coat of MCrAlY or diffusion aluminide (6), and a thermal barrier coating of YSZ (10) (col. 1, line 39- col. 2, line 32; col. 4, lines 49-60). Burns teaches that the bond coat may be 25-250 microns thick which overlaps with applicant's instant range of 76-635 microns (0.003-0.025 inches) (col. 3, lines 15-27). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a bond coating with a thickness taught by Burns in the composites taught by Bruce and Farmer, to provide proper adhesion between the ceramic layer and the substrate.

Conversely, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an amount of yttria that would stabilize the zirconia, regardless of how it is deposited or structured, thereby decreasing the cost of the coating. Therefore it would have been obvious to one of ordinary skill to use the amount of yttria taught by Bruce '088 in the coating of Farmer. Applicant has not shown that the amount of yttria relates to the formation of the DVC coating, and as such it is considered obvious to use a known amount of yttria, which will give the desired effect of stabilization.

Claims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burns et al (US 6,042,898) in view of Graham et al (US 6,432,487). Burns et al teach a thermal barrier coating system for a turbine engine component including a superalloy substrate, a bond coat of MCrAlY or diffusion aluminide (6), and a thermal barrier coating of YSZ (10) (col. 1, line 39- col. 2, line 32; col. 4, lines 49-60). Burns teaches that the bond coat may be 25-250 microns thick which overlaps with applicant's instant range of 76-635 microns (0.003-0.025 inches). Burns et al do not teach alternative thermal barrier coating

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that may be applied in place of the YSZ. Graham et al teach a dense vertically cracked thermal barrier coating for turbine engine components. The dense vertically cracked coating comprises zirconia stabilized with 6-8 wt% yttria. The dense vertically cracked coating can be applied with a plurality of up to 8 layers, each with a thickness of 0.002 inches, which overlaps with applicant's claimed range of 5-100 mils. This DVC produces a dense, hard coating with mechanical and thermal properties desired in such a coating (col. 1, lines 15-21). As it is taught by Graham that a dense vertically cracked YSZ coating provides a dense, hard coating with desirable properties for coating a turbine blade component, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the ceramic DVC YSZ coating of Graham in place of the ceramic YSZ coating of Burns to provide a turbine component with a dense, hard coating having improved thermal and mechanical properties.

Regarding the amount of yttria used to stabilize the zirconia in the coating of Graham, the range of 6-8 wt% overlaps with that of the instant claims. Furthermore, it would have been obvious to one of ordinary skill to add an optimal amount of yttria in order to stabilize the zirconia.

#### *Response to Arguments*

Applicant's amendments and arguments have overcome the 102 rejections of record.

Applicant's arguments filed October 21, 2002 have been fully considered but they are not persuasive. Regarding the 103 rejection of Bruce (5,981,088) in view of Farmer (6,047,529), the rejection is maintained. Applicant states that Farmer refers to the possible use of a DVC deposition technique, and that the minimum amount of yttria should be at least 8 wt%, and Bruce '088 does not teach DVC coatings. It is acknowledged that Farmer does not teach a lower amount of yttria, and Bruce does not teach DVC coatings of YSZ. However, the rejection is based upon the combination of these two references. Farmer clearly teaches the application of a DVC coating to a turbine engine component, and teaches the advantages over YSZ coatings previously used. Farmer's teachings are directed to the structure of the ceramic coating, i.e. the vertical cracking. Farmer gives one example of the amount of

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yttria, which may be used for stabilization of the zirconia in the layer, and does not relate the amount of yttria to the formation of the coating structure.

Bruce's '088 teaching is directed toward the stabilization of zirconia with a lower amount of yttria. It had been typical in the art to use amounts greater than 6 wt % yttria to stabilize zirconia in thermal barrier coatings. Bruce teaches that stabilization can be maintained at lower amounts of yttria, thus reducing the overall cost of the coatings.

Since it is clearly shown by Farmer that DVC coatings are useful for coating turbine engine components, and it does not appear from the disclosure of Farmer or the instant specification that the amount of yttria affects the formation of the dense vertical cracks in the coating, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an amount of yttria that would stabilize the zirconia, regardless of how it is deposited or structured, thereby decreasing the cost of the coating. Applicant has not shown that the amount of yttria relates to the formation of the DVC coating, and as such it is considered obvious to use a known amount of yttria, which will give the desired effect of stabilization.

Conversely, the teaching of Farmer that deposition of YSZ by this method results in an improved structural coating provides motivation for one of ordinary skill to deposit the YSZ coating of Bruce '088 in such a manner so as to achieve this beneficial structure. And again, since there has been no link between the ability of the coating to be deposited in such a manner and the amount of yttria present, it would have been obvious to do so with a decreased amount of yttria, to decrease costs. There is no showing that the amount of yttria affects the way in which the coating is deposited, and is merely present as a stabilizer.

Applicant's amendment to include the new limitation of the thickness of the bond coat necessitated new grounds of rejection.

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*Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer McNeil whose telephone number is 703-305-0553. The examiner can normally be reached on Monday through Friday, 9:30AM-6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on 703-308-3822. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer McNeil  
Examiner  
Art Unit 1775



JCM  
November 20, 2002

  
DEBORAH JONES

SUPERVISORY PATENT EXAMINER